

CLAIMS

1. A switching power supply comprising:

5 a first series circuit, connected to both terminals of a direct current power supply, in which a primary winding of a transformer, a reactor, and a first switch are connected in series;

a second series circuit, connected to one of both terminals of the first switch and both terminals of the primary winding and the reactor, in which a second switch and a capacitor are connected in series;

10 a smoothing circuit smoothing a voltage developed across a secondary winding of the transformer; and

a control circuit alternately turning on and turning off the first and second switches,

wherein the transformer includes a main core, formed with a magnetic circuit, 15 on which the primary and secondary windings are wound with a given gap, and a plurality of auxiliary cores disposed in the given gap with a given distance in a circumferential direction of the primary winding, and

wherein the reactor is formed of a leakage inductance of the transformer.

20 2. The switching power supply according to claim 1,

wherein the transformer includes: a cylindrical inner bobbin on which the primary winding is wound; and an outer bobbin having a diameter larger than that of the inner bobbin on which the secondary winding is wound, and having a plurality of slits, formed in a given distance along the circumferential direction, 25 which accommodate the plurality of auxiliary cores, respectively, and

wherein the inner bobbin is mounted to the main core under a condition where the inner bobbin is inserted to the outer bobbin.

3. The switching power supply according to claim 1,

30 wherein the transformer includes: a cylindrical inner bobbin on which the

primary winding is wound; and an outer bobbin having a diameter larger than that of the inner bobbin on which the secondary winding is wound, which is made of insulating magnetic material, and

wherein the inner bobbin is mounted to the main core under a condition where
5 the inner bobbin is inserted to the outer bobbin.

4. A switching power supply comprising:

a first series circuit, connected to both terminals of a direct current power supply, in which a primary winding of a transformer, a reactor, and a first switch
10 are connected in series;

a second series circuit, connected to one of both terminals of the first switch and both terminals of the primary winding and the reactor, in which a second switch and a capacitor are connected in series;

a smoothing circuit smoothing a voltage developed across a secondary winding
15 of the transformer;

a control circuit alternately turning on and turning off the first and second switches; and

a feedback winding, located on a secondary side of the transformer, which allows energy stored in the reactor when the first switch is turned on to be
20 circulated to the secondary side when the first switch is turned off,

wherein the transformer, formed with a magnetic circuit, including: a main core that has a central leg on which the primary winding of the transformer and the feedback winding are wound with a given gap and a side core on which the secondary winding of the transformer is wound; and a plurality of auxiliary cores
25 disposed in the given gap with a given distance in a circumferential direction of the primary winding, and

wherein the reactor is formed of a leakage inductance of the transformer.

5. The switching power supply according to claim 4,

30 wherein the transformer includes; a cylindrical inner bobbin on which the

primary winding is wound; and an outer bobbin having a diameter larger than that of the inner bobbin on which the feedback winding is wound, and having a plurality of slits, formed in a given distance in the circumferential direction, which accommodate the plurality of auxiliary cores, respectively, and

5 wherein the inner bobbin is mounted to the central leg of the main core under a condition where the inner bobbin is inserted to the outer bobbin.

6. The switching power supply according to claim 4,

10 wherein the transformer includes; a cylindrical inner bobbin on which the primary winding is wound; and an outer bobbin having a diameter larger than that of the inner bobbin on which the feedback winding is wound, which is made of insulating magnetic material, and

 wherein the inner bobbin is mounted to the main leg of the main core under a condition where the inner bobbin is inserted to the outer bobbin.

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7. The switching power supply according to any one of claims 1 to 6, further comprising:

 a saturable reactor connected to both terminals of the primary winding of the transformer to utilize a saturable characteristic of the core of the transformer,

20 wherein the control circuit turns off the second switch when a current of the second switch increases.